

Practice: 442 - Sprinkler System**Scenario: #1 - Gravity to Pivot Conversion****Scenario Description:**

Description: Installation of a low pressure center pivot system.

Resource concerns include: Soil Erosion (Concentrated flow erosion e.g. irrigation induced), Insufficient Water (Inefficient use of irrigation water), Water Quality Degradation (Excess nutrients in surface and ground waters, Excessive salts in surface and ground waters, Excess pathogens and chemicals from manure, bio-solids or compost applications).

Associated Practices: Irrigation Pipeline (430), Pumping Plant (533), Irrigation Water Management (449)

Before Situation:

A 160 acre field is flood irrigated. Application of irrigation water is inefficient and non-uniform. Irrigation water is typically over applied in some parts of the field, and under applied in others. Deep percolation from the excess irrigation delivers excess nutrients salts, and chemicals to the ground water. Runoff from the field contains excess nutrients and degrades the receiving waters. Irrigated induced erosion is excessive.

After Situation:

The existing surface irrigation system is converted to a low pressure center pivot. Corners are converted to non-irrigated cropland. The pivot is 1300 feet in length with pressure regulators and low pressure sprinklers.

The new irrigation system applies water efficiently and uniformly to maintain adequate soil water for the desired level of plant growth. Deep percolation and field runoff is eliminated and there are no excess nutrients, salts or pathogens delivered to the receiving waters. Irrigation induced runoff is eliminated.

This center pivot scenario includes all hardware from the pivot point, including the concrete pad the pivot is placed on.

Scenario Feature Measure: Length of Center Pivot Lateral

Scenario Unit: Linear Feet

Scenario Typical Size: 1,300

Scenario Cost: \$97,703.89

Scenario Cost/Unit: \$75.16

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Materials						
Irrigation, Center pivot system with appurtenances, variable cost portion	318	Variable cost portion of the center pivot system with appurtenances. This portion includes the following items: pivot point, pipe, towers, pad, controls, sprinklers, installation.	Foot	\$69.98	1300	\$90,974.00
Irrigation, Center pivot system with appurtenances, fixed cost portion	317	Fixed cost portion of the center pivot system with appurtenances. This portion includes the following items: pivot point, pipe, towers, pad, controls, sprinklers, installation.	Each	\$6,390.21	1	\$6,390.21
Mobilization						
Mobilization, very small equipment	1137	Equipment that is small enough to be transported by a pick-up truck with typical weights less than 3,500 pounds. Can be multiple pieces of equipment if all hauled simultaneously.	Each	\$73.50	1	\$73.50
Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$266.18	1	\$266.18

Practice: 442 - Sprinkler System**Scenario: #2 - Linear Move System****Scenario Description:**

This practice includes converting from a gravity irrigated system to a linear irrigation system (lateral move).

Resource concerns include: Soil Erosion (Concentrated flow erosion e.g. irrigation induced), Insufficient Water (Inefficient use of irrigation water), Water Quality Degradation (Excess nutrients in surface and ground waters, Excessive salts in surface and ground waters, Excess pathogens and chemicals from manure, bio-solids or compost applications), Inefficient Energy Use (Equipment and facilities e.g. pumping)

Associated Practices: Irrigation Pipeline (430), Pumping Plant (533), Irrigation Water Management (449)

Payment rate is figured per foot of installed hardware length.

Before Situation:

A 76 acre field is flood irrigated. Application of irrigation water is inefficient and non-uniform. Irrigation water is typically over applied in some parts of the field, and under applied in others. Deep percolation from the excess irrigation delivers excess nutrients salts, and chemicals to the ground water. Runoff from the field contains excess nutrients and degrades the receiving waters. Irrigated induced erosion is excessive.

After Situation:

A typical unit is approximately 76 acres in size with the sprinkler system typically 1280 feet in length.

Irrigation water is efficiently and uniformly applied to maintain adequate soil water for the desired level of plant growth. Deep percolation and field runoff is eliminated and there are no excess nutrients, salts or pathogens delivered to the receiving waters. Irrigation induced runoff is eliminated.

Scenario Feature Measure: Length of Linear Move Lateral

Scenario Unit: Linear Feet

Scenario Typical Size: 1,280

Scenario Cost: \$122,503.56

Scenario Cost/Unit: \$95.71

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Materials						
Linear Move System with appurtenances	322	Linear/lateral move system including: central tower, lateral towers, pipes, sprinklers, controllers, installation.	Acre	\$1,602.95	76	\$121,824.20
Mobilization						
Mobilization, very small equipment	1137	Equipment that is small enough to be transported by a pick-up truck with typical weights less than 3,500 pounds. Can be multiple pieces of equipment if all hauled simultaneously.	Each	\$73.50	2	\$147.00
Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$266.18	2	\$532.36

Practice: 442 - Sprinkler System**Scenario: #4 - Gravity to Pivot Conversion with VRI****Scenario Description:**

Upgrading existing irrigation system with a more uniform and efficient (vendor provided and installed modular system) Center Pivot system for the purpose of protecting water quality and utilizing water effectively. Integrating variable application technology onto a center pivot system for precision zone placement of water along the length of the system for water savings. A variable application over the field based either 1) EM mapping and a grid system, 2) previous year(s) harvest yield maps or 3) soil properties, or combination of each. This scenario is a new system to replace an existing gravity system, with the proper components, nozzles, and pressure regulating devices, along with other needed components for installation of a VRI system for more effective utilization of water.

Resource concerns include: Soil Erosion (Concentrated flow erosion e.g. irrigation induced), Insufficient Water (Inefficient use of irrigation water), Water Quality Degradation (Excess nutrients in surface and ground waters, Excessive salts in surface and ground waters, Excess pathogens and chemicals from manure, bio-solids or compost applications), Inefficient Energy Use (Equipment and facilities e.g. pumping), and protection of wetland areas enrolled in conservation program and other environmentally sensitive areas.

Associated Practices: Irrigation Pipeline (430), Pumping Plant (533), Irrigation Water Management (449), Wetland Restoration (657), Wetland Enhancement (658) Wetland Creation (659)

Before Situation:

Flood application of irrigation water is inefficient and non-uniform. Irrigation water is typically over applied in some parts of the field, and under applied in others. Deep percolation from the excess irrigation delivers excess nutrients salts, and chemicals to the ground water and receiving stream. Additional energy input needed to apply sufficient water to entire field. Irrigated induced erosion is excessive. Water runs off the field and degrades the receiving waters. Deep percolation in some parts of the field degrades the ground water quality. The runoff from the field causes soil erosion.

After Situation:

A new Center Pivot or Linear Move sprinkler system with a span of 1300 linear feet and a modular VRI system which increases irrigation efficiency and uniformity utilizing a modern center pivot system resulting in water savings. The irrigation water is applied efficiently and uniformly to maintain adequate soil moisture for optimum plant growth. Runoff and deep percolation are eliminated, and the surface and ground water is no longer degraded. The irrigation induced soil erosion caused by runoff is also eliminated. The lower pressure requirements of the sprinklers reduces the energy used by the pump.

Scenario Feature Measure: Length of Center Pivot or Lateral Move

Scenario Unit: Foot

Scenario Typical Size: 1,300

Scenario Cost: \$117,118.42

Scenario Cost/Unit: \$90.09

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Materials						
Valve, Pressure Regulating	2452	Valve installed between pump and pivot to reduce flow as pressure increases.	Each	\$1,541.67	1	\$1,541.67
Irrigation, Center pivot system with appurtenances, fixed cost portion	317	Fixed cost portion of the center pivot system with appurtenances. This portion includes the following items: pivot point, pipe, towers, pad, controls, sprinklers, installation.	Each	\$6,390.21	1	\$6,390.21
Irrigation, Center pivot system with appurtenances, variable cost portion	318	Variable cost portion of the center pivot system with appurtenances. This portion includes the following items: pivot point, pipe, towers, pad, controls, sprinklers, installation.	Foot	\$69.98	1300	\$90,974.00
Nodes, Expansion, Variable Rate Irrigation	2464	Expansion Nodes that provide both power and control signals to valves.	Each	\$610.24	4	\$2,440.96
Valve, Variable Rate	2456	Valves required for controlling flow at individual drop nozzles.	Each	\$102.72	120	\$12,326.40
Global Position System	2454	GPS installed on the irrigation system to transmit location in the field back to the controller.	Each	\$2,312.50	1	\$2,312.50
Tubing	2455	Valve tubing used to neumatically control variable rate valves.	Foot	\$0.61	1300	\$793.00

Mobilization

Mobilization

Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$266.18	1	\$266.18
Mobilization, very small equipment	1137	Equipment that is small enough to be transported by a pick-up truck with typical weights less than 3,500 pounds. Can be multiple pieces of equipment if all hauled simultaneously.	Each	\$73.50	1	\$73.50

Practice: 442 - Sprinkler System**Scenario: #5 - VRI System Retrofit Zone****Scenario Description:**

Integrating variable application technology onto a center pivot system for precision zone placement of water along the length of the system for water savings. A variable application over the field based either 1) EM mapping and a grid system, 2) previous year(s) harvest yield maps or 3) soil properties, or combination of each. This scenario is to renovate a previously irrigation system with proper modular components and pressure regulating devices, with GPS for field location and new control panel to update existing panel, along with other needed components to install a VRI system for more effective utilization of water.

Resource concerns include: Soil Erosion (Concentrated flow erosion e.g. irrigation induced), Insufficient Water (Inefficient use of irrigation water), Water Quality Degradation (Excess nutrients in surface and ground waters, Excessive salts in surface and ground waters, Excess pathogens and chemicals from manure, bio-solids or compost applications), Inefficient Energy Use (Equipment and facilities e.g. pumping), and protection of wetland areas enrolled in conservation program and other environmental sensitive areas.

Associated Practices: Irrigation Pipeline (430), Pumping Plant (533), Irrigation Water Management (449), Wetland Restoration (657), Wetland Enhancement (658) Wetland Creation (659)

Before Situation:

A center pivot or lateral move system has low pressure sprinklers. Water runs off the field and degrades the receiving waters. Deep percolation in some parts of the field degrades the ground water quality. The runoff from the field causes soil erosion. The high pressure requirement for the system requires excess energy use.

After Situation:

A Center Pivot or Linear Move sprinkler system with a span of 1300 linear feet is has modular VRI components added to the system which increases irrigation efficiency and uniformity utilizing a modern center pivot system resulting in water savings. The irrigation water is applied efficiently and uniformly to maintain adequate soil moisture for optimum plant growth. Runoff and deep percolation are eliminated, and the surface and ground water is no longer degraded. The irrigation induced soil erosion caused by runoff is also eliminated. The lower pressure requirements of the sprinklers reduces the energy used by the pump.

Scenario Feature Measure: Length of Center Pivot or Lateral with VRI Components for system renovation

Scenario Unit: Foot

Scenario Typical Size: 1,300

Scenario Cost: \$24,379.99

Scenario Cost/Unit: \$18.75

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Equipment/Installation						
Aerial lift, telescoping bucket	1893	Aerial lift, bucket truck or cherry picker, typical 40' boom. Equipment only.	Hour	\$48.37	24	\$1,160.88
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$29.26	24	\$702.24
General Labor	231	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$18.71	24	\$449.04
Equipment Operators, Light	232	Includes: Skid Steer Loaders, Hydraulic Excavators <50 HP, Trenchers <12", Ag Equipment <150 HP, Pickup Trucks, Forklifts, Mulchers	Hour	\$22.38	24	\$537.12
Materials						
Pivot Conversion to Variable Rate Irrigation	2450	Control panel with controllers, communication system, sensors, monitoring equipment, etc. Required on all variable rate irrigation system conversions regardless of length	Each	\$1,850.00	1	\$1,850.00
Valve, Pressure Regulating	2452	Valve installed between pump and pivot to reduce flow as pressure increases.	Each	\$1,541.67	1	\$1,541.67
Global Position System	2454	GPS installed on the irrigation system to transmit location in the field back to the controller.	Each	\$2,312.50	1	\$2,312.50

Materials

Tubing	2455	Valve tubing used to neumatically control variable rate valves.	Foot	\$0.61	1300	\$793.00
Valve, Variable Rate	2456	Valves required for controlling flow at individual drop nozzles.	Each	\$102.72	120	\$12,326.40
Nodes, Expansion, Variable Rate Irrigation	2464	Expansion Nodes that provide both power and control signals to valves.	Each	\$610.24	4	\$2,440.96

Mobilization

Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$266.18	1	\$266.18
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Practice: 442 - Sprinkler System**Scenario: #6 - VRI System Retrofit Speed****Scenario Description:**

Integrating variable application technology onto a center pivot system for precision zone placement of water along the length of the system for water savings. A variable application over the field based either 1) EM mapping and a grid system, 2) previous year(s) harvest yield maps or 3) soil properties, or combination of each. This scenario is to renovate a previous irrigation system with GPS for field location and new control panel to update existing panel, for a speed control VRI system for more effective utilization of water. Scenario requires that existing irrigation system meets Conservation Practice Standard 442 for uniformity and efficiency, if not, then system renozzling required.

Resource concerns include: Soil Erosion (Concentrated flow erosion e.g. irrigation induced), Insufficient Water (Inefficient use of irrigation water), Water Quality Degradation (Excess nutrients in surface and ground waters, Excessive salts in surface and ground waters, Excess pathogens and chemicals from manure, bio-solids or compost applications), Inefficient Energy Use (Equipment and facilities e.g. pumping)

Associated Practices: Irrigation Pipeline (430), Pumping Plant (533), Irrigation Water Management (449)

Before Situation:

A center pivot or lateral move system has low pressure sprinklers. Water runs off the field and degrades the receiving waters. Deep percolation in some parts of the field degrades the ground water quality. The runoff from the field causes soil erosion. The high pressure requirement for the system requires excess energy use.

After Situation:

A Center Pivot or Linear Move sprinkler system with a span of 1300 linear feet is has modular VRI components added to the system which increases irrigation efficiency and uniformity utilizing a modern center pivot system resulting in water savings. The irrigation water is applied efficiently and uniformly to maintain adequate soil moisture for optimum plant growth. Runoff and deep percolation are eliminated, and the surface and ground water is no longer degraded. The irrigation induced soil erosion caused by runoff is also eliminated. The lower pressure requirements of the sprinklers reduces the energy used by the pump.

Scenario Feature Measure: Length of Center Pivot or Lateral with VRI Components for system renovation

Scenario Unit: foot

Scenario Typical Size: 1,300

Scenario Cost: \$4,162.50

Scenario Cost/Unit: \$3.20

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Materials						
Global Position System	2454	GPS installed on the irrigation system to transmit location in the field back to the controller.	Each	\$2,312.50	1	\$2,312.50
Pivot Conversion to Variable Rate Irrigation	2450	Control panel with controllers, communication system, sensors, monitoring equipment, etc. Required on all variable rate irrigation system conversions regardless of length	Each	\$1,850.00	1	\$1,850.00